SOUHEGAN TECHNICAL REVIEW COMMITTEE
NH Rivers Management and Protection Program
New Hampshire Department of Environmental Services
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Souhegan TRC Committee Meeting Minutes
Monday, March 13, 2006
DES Auditorium
29 Hazen Drive, Concord, NH

Members Present:	**Technical Representatives**
Douglas Bechtel	Conservation Interests, The Nature Conservancy
Jeff Deacon	USGS, District Chief, NH-Vermont District
Alden Greenwood	Business Interests, Alden Engineering
Dr. Kenneth D. Kimball, Chair	Conservation Interests, AMC Research Dept
Vernon B. Lang	US Fish & Wildlife Service, NE Field Office
James MacCartney	Conservation Interests, Trout Unlimited
John R. Nelson	Business Interests, Geological Society of NH
Thomas Roy, Vice Chair	Business Interests, Aries Engineering, Inc.
Members Absent:	
Ralph W. Abele	US EPA, Manager of NH State Program Unit
Representative Richard T. Cooney	House of Representatives, RR&D Committee
William C. Ingham	NH Fish & Game Department
Carl Paulsen	Conservation Interests, NH Rivers Council
Donald L. Ware	Business Interests, Pennichuck Water Works

Others Present:	**Affiliation**
Spencer Brookes	Souhegan LAC
W.F. Warren	Amherst Country Club
Jamin Warren	Amherst Country Club
Nelson Disco	Souhegan River LAC
Al Larson	Normandeau Associates
Mark Hutchins	Normandeau Associates
Lee Carbonneau	Normandeau Associates
Tom Ballestero	University of New Hampshire
Sharon Rogers	University of New Hampshire
Tom Seager	University of New Hampshire
Jen Jacobs	University of New Hampshire
Mark Hutchins	Normandeau Associates
Amit Taneja	Pilgrim Foods
Piotr Parasiewicz	NEIHP UMASS
Alex Levy	Gomez & Sullivan
John Magee	NH Fish and Game
William F. Ruoff	Director Public Works, Milford, New Hampshire
Spencer Brookes	Souhegan LAC
Diane Fitzpatrick	Souhegan River LAC
Elizabeth Sanders	NH House of Representatives, RR&D Committee
Allan Palmer	PSNH
F. Vincent Gerbino	Monadnock Mountain Spring Water

DES Staff Present:

Wayne Ives, Instream Flow Coordinator
Marie Loskamp, Executive Secretary, Watershed Management Bureau
Steve Couture, DES, Rivers Coordinator
Mike Sills, DES, Waste Management
Paul Currier, DES, Administrator Watershed Management Bureau
Ken Edwardson, DES, Watershed Management Bureau

9:30 – 9:45 Acceptance of February 13, 2006 minutes

Chair Ken Kimball opened the meeting and requested a motion to accept the minutes of the February 13, 2006 meeting.

- **Vern Lang made a motion to accept the minutes of the of the February 13, 2006 meeting as presented, Jim MacCartney seconded the motion, there was no discussion and the vote was unanimous to accept the minutes of February 13, 2006.**

Wayne introduced the process this morning. The document we have to review today is the draft Proposed Protected Instream Flows (PISF). In a couple of weeks we will have an actual Proposed PISF and it will be what we are going to presenting to the public. Make sure you feel comfortable with what has been stated in the draft.

Ken stated that as we go through the presentation, there is a lot of material, we want to encourage questions but at the same time we need to get through it all today.

9:30 – 9:45 UNH – Draft Proposed Souhegan PISF

Tom Ballestero passed out paperwork on the flow duration curve. We will go in order today through all the IPUOCR entities and basically the results. These are the instream flows that we are recommending. Two hundred pages plus were given to you on March 6th, and we appreciate any and all comments you can give us.

- **We need feedback on two basic issues, one is the big document, and an ideal would be to have a 5 to 10 page executive summary that is concise. That executive summary doesn't exist yet. The rudiments of it are there. The data will be put into the Department's environmental database.**

Al Larson passed out handouts of the Normandeau presentations. Normandeau reviewed the IPUOCRs. Al will be going over recreational IPUOCRs: boating, fishing, and water supply. **Mark Hutchings** will be talking about the hydrolytic facilities, water pollution abatement and also water quality standards and lastly **Lee Carbonneau** will be talking about natural communities: rare, threatened and endangered species. This will transition into **Piotr's** presentation.

Al Larson - The principal users for recreation are kayaking and canoeing in the spring and during high flow events during the summer. The river is not navigable at low flows. The most popular sections are from Greenville down to Wilton. Based on interviews 700 cfs relative to the Merrimack gauge is the minimum flow for running the river. Water users use the Merrimack gauge, the Contoocook gauge, word of mouth and a web site for flows. A table in the presentation summarizes the protected instream flows for recreation.

Fishing on the Souhegan is actively managed by Fish &Game as a cold water fishery. There are special areas for angling plus easy shoreline access and wading. There are special rules on the Souhegan especially in Greenville/Wilton section. There is no closed season for all species except for salmon and smelt from October 16 to June 15 you have to use artificial lures or flies that are barbless and then from June 16th to October 15th fish can be taken but there is a limit. Fish stocking is done for eastern brook trout, rainbow trout and brook trout in numerous sections. There are also warm water fisheries: sunfish, perch, bass and bluegill.

Public water supplies are systems that provide public water for human consumptions for at least 15 service connections and reasonably serve an average of at least 25 individuals at least 60 days of the year.

Surface water and ground water – Greenville water works located in Temple has no direct diversion of water from the Souhegan River from our collected use information and is therefore not dependent on the Souhegan River. Groundwater - Wilton, Milford and Pennichuck Water Supply districts use groundwater supplies. These groundwater supplies are not involved with flow and so this groundwater is not dependent on the Souhegan so there is no proposed management.

Mark Hutchins - There are not a lot of active hydroelectric systems in the watershed. There are four, three in the Greenville area and one in Wilton. The minimum operational flows for these facilities are what we selected for PISFs. We don't have the actual maximum operational flows for them yet, but we will be getting those. In Greenville the minimum operational flows are on the order of 15 to 20 cfs, which is approximately 0.7 cfsm. Downstream at the Pine Valley facility, there are minimum operational flows of about 42 cfs which is about 0.4 cfsm. Basically we took the identified protected instream flows for the hydro-facilities and correlated them with the reaches that Piotr has identified for his fishery work. So for the hydropower PISF, we are looking at approximately 20 cfs or 0.7 cfsm for Reach 1. For Reach 2, there are no hydropower users so there is no PISF designated for that use. Reach 3 contains the Pine Valley facilities so the PISF there would be 42 cfs or about 0.44 cfsm. Downstream in reaches four through seven there are no active hydro facilities so there is no PISF necessary to protect the hydroelectric power IPUOCR.

We have 3 licensed wastewater discharges in this system: Greenville Wastewater Treatment Plant, Milford Fish Hatchery and Milford Wastewater Treatment Plant. The Greenville facility has a design flow of 0.233 million gallons per day which is approximately 0.35 cfs. The fish hatchery is 2.5 million gallons per day which is approximately 4 cfs and the Milford Wastewater Treatment Plant is 2.15 million gallons per day or approximately 3.2 cfs. Treatment facilities are permitted in several ways. One is a performance-based permit, and with respect to municipal treatment plants, there is a certain expectation of performance for certain parameters (like BOD and Suspended Solids) that is typically equivalent to secondary treatment. Other compliance conditions like toxicity are permitted on an instream basis. In the case of the Greenville and Milford treatment plants their toxicity requirements are based on instream considerations. The Fish Hatchery does not have toxicity concerns and therefore is not permitted based on stream flow.

With respect to Milford and Greenville, they are permitted based on 7Q10 flows which are what most toxics are permitted on. For Greenville, their chronic toxicity test is required to be run with a solution that contains 14.5 % of effluent. Basically what that is saying is that the test is supposed to represent the dilution that the discharge would receive on the 7Q10 flow conditions. For Greenville that 7Q10 flow is about 2.4 cfs and it is equivalent to less that .l cfsm. For Milford the discharge is slightly larger relative to the size of the watershed and chronic toxicity tests are required to be run on a solution that is 28% effluent. This is saying that the expectation is that at 7Q10 flows the discharge would be diluted by a factor of about 4. In any event the 7Q10 flow has been estimated by the UNH group as approximately 9.4 cfs at the Milford discharge which is equivalent to 0.1 cfsm.

One of the other things that we have to do relative to protected instream flows is to assess whether those PISF protect the Water Quality Standards. We looked at it in two ways. First we looked at the 2004 305(d) and 303(b) reports which are the biannual reports that DES has to prepare which identifies waters of the state that do not meet various water quality criteria. All waters are listed as non-supporting of aquatic life with respect to mercury. Mercury's source is atmospheric; it is pervasive throughout the North East.

Another section in the upper portion of the river above the confluence of Stony Brook is listed as non-supporting to aquatic life due to pH, aluminum and some of the biological tests are used in that area. There is also a short section in this area that is listed as non-supporting in terms of primary contact recreation due to bacteria (e. coli) presence. All of these contaminants are listed as source unknown, and it is probably that pH and aluminum are related to acid rain and as with mercury, also atmospheric. The biological stuff may be related to the pH and aluminum, and e. coli probable is related to nonpoint source. We have concluded that it is unlikely a PISF in the upper portion of the river would have any effect on whether water quality standards are being met. We have not proposed a water quality PISF for the upper portion of the river from Milford discharge upstream.

In the lower section, the river is listed as threatened for aquatic life due to copper, and the copper source is identified as a municipal discharge which is in fact Milford's discharge. Milford actually has

copper limits in place in their discharge. The numeric values are determined from 7Q10 flow. The whole 7Q10 flow thing becomes a bit complicated in that, according to DES regulation, Water Quality Standards don't apply for aquatic life and human health criteria with the exception of carcinogens when flow is less than 7Q10. So in an actual situation if flow was less than 7Q10 then the WQS would not apply, so a PISF would not be required. However, it is our judgment that users are artificially influencing the hydrograph and they are likely causing flows to drop below the 7Q10 values at times when that would not normally happen. We examined the last 5 years of the flow record, and determined that we had one three day period during 2001 during a drought where the flow fell below the 7Q10 values and in fact it was below by one 1 to 2 cfs which is comparable to the long term monthly use of stream flow by the users. In the lower part of the river that value is 1 to 2 cfs which is being withdrawn from the river depending on where you are in the watershed. For that reason we believe that the system in its present state is not protecting the PISF goal of 7Q10 for the lower portion of the river and that it is likely not meeting the WQS requirements.

Lee Carbonneau Lee put together a bio-period graph for the other natural resources, you have seen this before for fish. The high flows in the spring have several relationships to natural resources. They fill some of the backwaters, and scour some of the higher flood plains and the high energy riverbank resources. As the flows fall in the summertime, we have seen breeding amphibians including toads, nesting of wood turtles, and as we slowly lose water the vegetation is developing. In the wintertime we have wood turtles that are returning to the river for either just over wintering or hibernation in the river channel and riverbanks.

As a reminder we have in the upper section of the Souhegan twisted sedge low river bank above the summer water level we have a small area of fern glade. These are high flow related and they are tolerant of low flows in the summer.

As a reminder of how we looked at flow and water elevations, we did the transect method where we mapped the natural communities, put transects across it, developed a cross section and mapped water levels at different flows. In the winter time we have ice scour. In the spring the flooding that extends up over these communities keeps the same plants regenerating. In the summer the low flows drop just below the edge of the twisted sedge community. If they drop further it is possible that the twisted sedge community can actually span down into that area.

There are two different flood plain forest types. We have the sycamore flood plain forests which you find in the higher end of the Souhegan, typical of more flashy systems, generally in cobbley portions of the river and limited to a couple of locations. These are also high flow dependent, not low flow dependent. There are some changes going on in the hydro period. Low flood plain forest would typically have periodic flooding every one to three years. We also had the Silver Maple flood plain forest spanning the lower Souhegan River where it is meandering and the soils are typically much finer. It is also a high flow dependent community tolerant of low flows so summer flows are not critical. We saw these communities flooding much more frequently; every one to three years, sometimes several times a year. On the transects we examined where we have Silver Maple flood plain forests, this occurred when the flows at the Merrimack gauge were about 2000 cfs.

The oxbow and backwater marsh are high flow and low flow dependent. They are very tolerant of changes in the flow during the growing season and other times of the year.

The spring flows required to actually flood these are less than the ones required to flood the forested areas around them, but typically the marshes are higher than lowest elevation in the river channel. We saw flooding to the edges of the marshes at about 600 cfs. The water levels decline during the summer but maintain some level of water. We determined that about 2 feet of water kept the floating-leaved aquatics and emergents floating, and that needs to occur during growing season, but again they are tolerant of fluctuations so that it doesn't have to be the case all of the time. The flows of about 30 cfs kept enough water in most of those deeper emergent wetlands to sustain all of the plants that we found there.

The wood turtle is a resident of the lower Souhegan and was seen in several locations and it is flow dependent during summer nesting season and also during the over wintering season. Around May or June the turtles are coming out of the river and nesting in the sandy or gravely soils, sometimes in the flood plain itself, sometimes in the uplands above the flood plain. Their nesting success is typically low, and in part that is due to predators and can also occur from summer flooding of their nesting sites. We do not know exactly were their nests are. Some turtles nest lower in the flood plain and those that nest higher in the flood plain have a better survival rate. The flows for turtles of 1000 cfs or lower in summer would protect their nests from flooding.

In winter, we typically find wood turtles either hibernating in the banks of the rivers or under debris in the channel. Sometimes they are not hibernating, they are actually moving in the water channel, just over wintering in the water and they actually move around in response to different stimuli. If the winter water levels are on average above the water levels that occur when they go into hibernation, then those that are in stable locations and hibernating would not be exposed. If November, December, January and February water levels on average are higher than the October flows, the wood turtles hibernating in the banks or shallow areas of the rivers would be protected.

We saw many common American toads. They are sensitive to low flows during the breeding season. Sufficient water in the oxbows while their eggs are developing and their tadpoles are developing before they leave would require about 30 cfs. There is a lot of variability in how connected the backwaters and Oxbows where they are breeding are to the river, so this is a level that we determined could maintain most of the shallow back waters where we saw them breeding, without drying out. Typically they are gone by mid-August. These flows just need to be maintained until that time.

Osprey and loons are transient individuals in the area and not necessarily nesting or requiring habitat during the entire breeding season. They are both fish eating birds, and are most dependent upon having a fish supply while in the area.

Two plant species that we have seen in the area, wild garlic and wild sienna, are both floodplain species. They are both tolerant of fairly dry conditions. Typically they would be more likely found in high flood plains, 10 year return flood or less. We saw these on the banks of the river well above the summer flow season levels and well above the flood plain altogether, but periodic scouring could be important for dispersing seeds and keeping competition down, keeping the canopy open. This 10 year return flood is on the order of 5,000 cfs and that is a flow that they would require. They are not low flow dependent.

Piotr – We will talk about existing fauna, bioperiod indicator species, available fish habitat, and then propose PISFs as well as management applications.

There are two target fish communities (TFCs) that we developed for the two portions of the river. One is for the Upper Souhegan, which is upstream of Wilton. The species that we identified (see graph in presentation) for the Upper Souhegan are grouped to macro-habitat guilds. According to the TFC, we should have 67% fluvial specialists and about 18% fluvial dependent species. For comparison, to the right there is a modeled existing fish community (XFC, from collected fish data) and below is what we have actually captured in the river last year (data used for development of XFC). Last year we didn't find many macro-habitat generalists or fluvial dependent species. The next table presents summaries of fish observations from last year, habitat guilds as well as the pollution and temperature intolerance. The greatest difference between the Target Fish Community and existing fauna are the low numbers of Atlantic salmon, common white sucker and common shiner (in most cases we have less than half the numbers we expected). Only fallfish, yellow perch, blacknose and longnose dace are in the expected proportions. These are species that are more commonly found in shallower waters. On the

relatively long list of missing species: American eel, yellow bullhead, creek chubsucker, Eastern brook trout, longnose sucker, and slimy sculpin are the most important.

Composition of target fauna as it relates to pollution tolerance - we should have proportions of about 12% of pollution intolerant species and we only have 1% of those in the river. We have about the same amount of moderate intolerant species and a higher number of pollution tolerant species.

Temperature – we would expect about 16% cold-water species and we have a pretty dramatic difference with only 1% of cold-water species. We would expect about 9% of warm water species and we have 2%. About 97% of the fauna consists of warm water species.

Common white sucker, fallfish, common shiner, blacknose dace, and longnose dace should dominate the Lower Souhegan. These are fluvial specialist and fluvial dependent species. In comparison with the TFC estimates, we observed a higher proportion of fluvial species (lower pie-chart). The modeled XFC documents higher numbers of generalists than the TFC.

In the next table common white sucker, which should be a dominant species and occur in 71% proportions in the river, was documented with only 30% of the species in the river. Fallfish, golden shiner and longnose dace are in expected proportions. Interestingly this time common shiner is in higher proportions than expected.

The list of introduced species is a little longer – there are two introduced species in the upper river. Low proportions of introduced species are good news.

Pollution tolerance – there is a similar scenario with the number of intolerant species reduced. However the proportion of moderately tolerant species is a little higher than expected. Thermal tolerance– the only thing that is different between the upstream is the number of cold-water species. We have almost no cold water species.

Habitat results – the next figure compares the expected proportion of species in the upper river with the proportion of existing fauna and with habitat as we found it at three different flows. What is interesting is that although we couldn't find a single brook trout in the stream, there is habitat available for brook trout. The same can be concluded for slimy sculpin; we have enough habitat for them. Common shiner and common white sucker are in larger proportions than expected and what is interesting is that the proportions almost correspond to the amount of habitat that is present for the species. We would conclude that for common white sucker and common shiner, habitat is a limiting factor in the Upper Souhegan. Due to the fact that we do not have many deep runs or pools in this area it is not surprising that these two species are not there.

In the Lower Souhegan there is some habitat for brook trout. With regard to white sucker we again did not catch many, but we have plenty of habitat for them. Further observations led to the conclusion that this is a spawning-related limitation. We did not find a lot of spawning habitat for white sucker in the lower river but plenty in the upper river. We know that we have several dams throughout the river so it is very likely that many of the bigger individuals from the lower river just do not make it to the spawning areas upstream. The second factor that I believe might be an important point is that white suckers are classic broadcast spawners and their eggs have a relatively long incubation time. They release the eggs, which remain glued to the substrate, and therefore they are very vulnerable to flow fluctuations. We know that in the springtime during the spawning season, this is the time when most of the power generation takes place. We observed on the hydrographs that this is the time we have a lot of flow fluctuations, which could expose eggs and could therefore be limiting the number of white sucker in the river. This is supported by the fact that in contrast we have more common shiners than habitat. This species doesn't have such a complicated reproductive cycle and they do well.

We found a lot of odonates and mussels, and mussels are doing well in the lower sections of the river. There are plenty of odonates in the lower section of the river and the upper river;

however we did not find very diverse fauna, just one or two species. Both of these groups do not appear to be very flow dependent.

We divided the river into Upper Souhegan and Lower Souhegan. Here is the map showing the delineation. Then we divided it into Reaches 1-11. Reach 1 is from Greenville to above Wilton, Reach 2 Wilton to the confluence, Reach 4 is upstream of Milford, in Milford Reach 5, 7 all the way to the Falls. Reach 8 wasn't included as we were not able to map it for a third time. The further analyses happened at the Reach level. Every reach received a representative site and gauge. For each gauge we simulated the flow to be used in the model. We developed models based on our habitat mapping in the representative sites.

We divided the year into bio-periods. For every bio-period we selected one or a group of species that had highest habitat needs.

Rating curves show generic resident adult fish (GRAF) habitat changes in the upper river. GRAF habitat is sensitive to flow. American eel has a lot of habitat. Atlantic salmon has a lot of habitat. Odonates do better in the lower river. Reach 3 stands out as different. Half of river has suitable habitat for baby fish.

Upper Souhegan River – spawning rating curve models – on all three Reaches we have plenty of common white sucker. Reach 2 has a lot of habitat and it is outstanding as having better habitat, more habitat and a lot of spawning habitat for various species. Reach 3 does not perform as well and we could see that it is strongly affected. Reach 1 falls somewhere in between. We tried to select species that are flow sensitive. The third model is American shad and Atlantic salmon. Reach 2 has a lot of habitat and shad habitat in the winter. Reach 3 doesn't have any Atlantic salmon habitat.

Reaches 4, 5, 6, and 7 – Reach 4 we have a lot of juvenile habitat and American eel habitat, but as you go downstream the habitat starts to be less sensitive to flow changes. Odonates that are in the lower most river respond well to relatively low flows and the further downstream we go the less habitat we have for our target species. Reach 4 is the only one that reacts to flow.

We conducted a simple restoration simulation by modifying the distribution of woody debris and added backwaters in areas where we believe it could have been historically and removed all the dams. We didn't change the hydraulics of the habitat, meaning we didn't change any riffles to pools. We created a new model for the rearing and growth season and showed the results. It increased brook trout habitat of Reach 2 and the habitat for all resident fauna. This demonstrated one of the possibilities. These measures didn't apply to lower areas of the river.

In the next step we selected indicator species and used the most sensitive rating curves and combined them with the hydrograph at the representative gauges. We conducted uniform continuous-under-threshold (UCUT) analysis. If the events on the habitat duration curve happen more frequently than 45% of time, then it is a common event. This rule does not apply to the spawning times, because spawning times just need to provide a window of opportunity for spawning, and doesn't have to last for most of the season.

Rearing and growth season habitat commonly appears in each of the 7 reaches, allowable duration, and how long habitat stays under this threshold. Common duration is 30 days, if it lasts for 43 days or longer it is a catastrophic event that should not appear more often than once in ten years.

Cut curves for Atlantic salmon spawning, selected the two best reaches, Reaches 2 and 5 and these had the most habitat and the most flow.

Souhegan River Temperature probes - Most important factor – temperature probes and spot measurements of temperature in the impoundments in the headwaters. Temperature in the pond and temperature downstream of the pond in August of 2005, temperature is 29 centigrade that flows out of ponds.

The average temperatures this year and last year are above lethal levels for brook trout and slimy sculpin. There are two ways to act against it. You can do something about the ponds and modify them to reduce the water temperature so that colder water is coming out of them, but you can also improve the habitat in the river to increase resiliency of the species and provide a refuge from these higher temperatures. On the Quinebaug River in Connecticut we documented that in the areas with better habitat we actually had more fish.

Basic conclusions that we would have from our study are that pollution and temperature sensitive species are under represented or missing. Brook trout and slimy sculpin are not limited by physical habitat, most obviously by the temperature. Diadromous species are completely missing, but they have enough habitat. There is plenty of habitat for eel, for shad spawning and for juvenile salmon.

Target Fish Community (TFC) is similar to existing fish communities but white sucker is a strongly underrepresented species. In the Upper Souhegan this lack of white sucker corresponds with the habitat proportions. It is not an indication of the lower river. Common shiner is under represented in the upper river but not in the lower river. Mussel and odonates are doing fine and they have plenty of habitat. The Upper Souhegan habitat is much more flow sensitive and we have seen very low flows and this makes the maintenance of frequency and duration specific to low flow events very important. So the rules developed here should be applied to provide some augmentation. During the spawning season in June, the beginning of summer, less flow is actually better so we would have an opportunity to shave some flows off and release them later on in the summer.

Reaches 2 and 5 are those with the best habitat. Reach 3 is obviously one of the most impaired.

Alex Levy – I have a technical question, on your graphs where you show area vs. flow, you said in your report, three flow measurements, did you collect these entirely?

Piotr – Yes we collected data at 3 flows and then we created rate curves and then calculated values and conclusions. Our observation are just to fit the curve.

Alex Levy – How did you interpret these created flows?

Piotr – Say if you create a habitat rating curve that tells you how much habitat at one specific flow, one measurement, second measurement and third measurement.

Piotr, why do you express the habitat in terms of percentage rather than flow?

Piotr – Because the river is getting smaller and bigger.

Is it still minor when talking about habitat restoration in the oxbows and side channels, does it stay minor then?

Piotr – No because then if allocation we get over a 100 percent so we have the same base line, the same base size.

Tom Ballestero – Hydrology and the ability of the existing system to meet the PISF.

We want to thank you for all your interest and ability to critique all of this. We are expecting a lot of input in return. Right now the difficulty is we have all instream flows, and I am basically going to go through everything that everyone said today, recreation, hydropower, fish, flora and fauna. This was the instream flow. If you recall, we had to compare these instream flows to the hydrology that we have in the system. That comparison is going to say either your meeting it or your not.

How do you want to see that data? We can show a horizontal line on the hydrograph and you can see whether or not the flowing river is above the line, or we can present it in tables. For example here is the system where all the reaches are and we show you a hydrograph at one location, the instream flow at that location and whether or not you meet it. Remember that for each reach there are about 20 different IPUOCRs so you have 20 graphs for each one and some of the IPUOCRs might have more than one flow. What is the easiest way to show it, and there may be some simple statistics. Fifteen percent of the time we don't need it. Where the rubber meets the road is when we go into management strategy. When we don't meet the ISF what are we going to do about it? I doubt we are going to do anything about the 10 year flood. We have to take all these ISF and then find what is most critical, and then what are we going to do about it, how can we operate the system. The reality is you do not have a lot of storage in this

system to do something about the high flows. We cannot make the kayaking much better than it already is. We don't have that kind of storage. On the other side of the coin, we do have storage that we might be able to impact the low flows.

To do this we had to generate hydrologic records, hydrographs, discharge vs. time at various locations along the river. So we did that for all of these seven reaches and we started with the USGS stream gauge, and the next thing we did was at about a dozen locations through the river we would monitor the flow after a few days of no rainfall runoff. So the system was more or less at steady state. We focused on the zero to 1 cfs range. When it gets higher than 1 cfs, it gets kind of dangerous to be standing in the river. With these concurrent flows then what we could do is we knew the flow at the same day that we took the concurrent flow measurement at the USGS gauge and we have a body of those data points that we can come up with a regression relationship and with those regression relationships we can create these representative hydrographs.

The form of regression equation was a power function, I know that the time honored way of doing this is a linear area weighting of watershed areas, but that breaks down the farther from the gage in this case upstream of Milford when the linear weighting wasn't the best way to go hence the power function flows.

Representative Hydrographs – this is what we were charged with, we were supposed to look at the last 5 years, a wet 3 year period, an average 3 year period and a dry 3 year period. The last five years there is no discrepancy about that, it is whatever records were available at the USGS gauge for the past 5 years. How did we delineate wet, average and dry? We looked at the average annual flow for those years and we looked at the precipitation for those years and we selected the records which would be representative of a wet period, a normal range and a dry range. Having spent hours and hours doing this, I think I am going to take the whole thing and run the whole 70 year record for these ISF, because we will get the real probability of what is really happening. You are going to have periods when you don't meet this ISF for a certain species and if it happens once every 10 years it is not the end of the world, but if it happens 3 years in a row now you have a problem.

Wayne March 28th, 15 days to look at this, if you have some part that you need to finish, get what you can and get it in. Try to get everything finalized by the 28th. Wayne has a print out, not necessarily here today, if you are an affected water user, dam owner or committee member, get in touch with Wayne.

Ken – Remind us what next steps are.

Wayne – Need written comments by the 28th, finalize the review and the responses and make revisions as appropriate, final PISF has to be completed as a final document put in library and made available to public before hearing, first week in May for public hearing. The second week in May we will hold hearing probably at Milford Town Hall for an Evening Meeting. After the public hearing another 30 day comment period, revise the final product which is now the PISF given to Commission for his approval, then we have the PISF for the river.

Ken – One some of IPUOCRs you will not meet, white water boating relies on water. Are we removing natural IPUOCRs out there that are detrimental to them? Look at ones we can do something about.

Tom – Ever since the project began what can the eventual solution be? It is much more subtle than that and there is flexibility, Piotr going through cut curves translated in to a minimum flow specifications attached to a duration of how much of the resource can we manage, where we can find cost effective ways to manage flows. The essence of this report – all flow dependent and this is what each one needs, biggest bang for the buck is look at temperature, make habitat more suitable.

Piotr – Divided into so many reaches, in future a gage on each reach, problematic way is to have two gages and just regulate two places, depict values for two places without showing how we got there.

There is a lot to digest, look forward to people's comments over the next few weeks.

Meet as a committee at the public hearing.

11:30 Meeting adjourned.